

AMENDMENT AND ELECTION  
Appin. No. 09/775,970

PATENT APPLICATION

IN THE SPECIFICATION:

Amend numbered paragraphs 35, 36, and 82-93 to read as follows:

35. Fig. 6 illustrates a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention, with an enhanced gap width implemented via a hybrid air plus LC gap.

36. Fig. 7 illustrates a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention, with an enhanced gap width implemented via a hybrid glass plus LC gap.

82. Referring to Fig. 7, a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention is illustrated, with an enhanced gap width implemented via a hybrid gap of glass and liquid crystal. A first etalon substrate 702 and a second etalon substrate 704 are spaced apart from one another. The etalon substrates 702, 704 are preferably formed of fused silica. Low phase shift dielectric reflector layers 710, 708 are coated onto each of respective opposed faces of the etalon substrates 702, 704.

83. A spacer plate 718 is disposed between the first and second

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etalon substrates 702, 704. Precision-dimensioned spacer beads 722, 724 define the spacing between the first etalon substrate 702 and the spacer plate 718. The spacer plate 718 is preferably formed of fused silica, as are the spacer beads 722, 724.

84. A first transparent conductor layer 706 is also coated onto the first substrate 702, and a second transparent conductor layer 712 is coated onto the face of the spacer plate 718 facing the first substrate 702. The transparent conductor layers 706, 712 are preferably formed of Indium Tin Oxide (ITO). A preferred proportion of components in the ITO is 4% Tin to 96% Indium Oxide.

85. The top coating layers on the first etalon substrate 702, and on the spacer plate 718 are liquid crystal alignment layers 714, 716. The alignment layers 714, 716 are formed of polyimide (preferably SE7492 polyimide). After coating, the polyimide alignment layers 714, 716 are each buffed to provide alignment functionality. A liquid crystal material 730 is filled in between the first etalon substrate 702 and the spacer plate 718. E-44 liquid crystal is preferred.

86. In the implementation illustrated by Fig. 7, the overall gap between the etalon substrate glass plates 702, 704 is augmented

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by inclusion of the high precision spacer plate 718. This gap augmentation permits higher spectral resolution measurements than is possible in a cell limited in gap width by the practical limit of liquid crystal (LC) thickness. Without the gap augmentation innovation, the largest gap thickness is approximately 100 microns. When this feature of the present invention is utilized it has been possible to manufacture gaps as large as 10 mm. Furthermore, larger gaps are possible. Fig. 6 illustrates an innovative aspect of the present invention wherein a precision glass spacer plate 718 is laminated to one of the etalon substrates 704, preferably using Norland NOA-63 UV adhesive. The reflector 708 coating remains beneath that lamination. The side of the spacer plate facing the LC includes the Indium Tin Oxide (ITO) layer 712 followed by a polyamide layer 716.

87. Referring to Fig. 6, a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention is illustrated, with an enhanced gap width implemented via a hybrid gap of air and liquid crystal. A first etalon substrate 602 and a second etalon substrate 604 are spaced apart from one another. The etalon substrates 602, 604 are preferably formed of fused silica. Low phase shift dielectric reflector layers 610, 608 are coated onto

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each of respective opposed faces of the etalon substrates 602, 604.

88. A spacer plate 618 is disposed between the first and second etalon substrates 602, 604. Precision-dimensioned spacer beads 622, 624 define the spacing between the first etalon substrate 602 and the spacer plate 618. The spacer plate 618 is preferably formed of fused silica, as are the spacer beads 622, 624.

89. Precision spacer posts 642, 644 define spacing dimension between the first and second etalon substrates 602, 604. The spacer posts 642, 644 are preferably formed of fused silica, are matched to  $1/4$  wavelength in height, and are flat to  $1/10$  wavelength. The spacer plate 618 is notched to provide clearance for the spacer posts 642, 644.

90. A first transparent conductor layer 606 is also coated onto the first substrate 602, and a second transparent conductor layer 612 is coated onto the face of the spacer plate 618 facing the first substrate 602. The transparent conductor layers 606, 612 are preferably formed of Indium Tin Oxide (ITO). A preferred proportion of components in the ITO is 4% Tin to 96% Indium Oxide.

91. The top coating layers on the first etalon substrate 602,

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and on the spacer plate 618 are liquid crystal alignment layers 614, 616. The alignment layers 614, 616 are formed of polyimide (preferably SE7492 polyimide). After coating, the polyimide alignment layers 614, 616 are each buffed to provide alignment functionality.

92. A liquid crystal material 630 is filled in between the first etalon substrate 602 and the spacer plate 618. E-44 liquid crystal is preferred. Thus, the LC cell is bounded by a notched (to accommodate the spacer posts) spacer plate and by one substrate. The spacer-plate and substrate on the other side of the LC are preferably held in place as a cell by epoxy.

93. In the implementation illustrated by Fig. 6, a method providing particularly large gaps is illustrated. According to this implementation, precision spacer posts separate the substrates. Rather than laminating the spacer plate to one of the etalon substrates, a large air gap G is formed.

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